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ABSTRACT

This Quinmester course includes installations, electrical and mechanical servicing, reverse cycle air conditioning, malfunctions, troubleshooting and repair, discharge, pump down, and recharging the system. The course may be taught as a two or three Quinmester credit course. In each instance the course consists of six instructional blocks: orientation, room air conditioner cycles, room air conditioning components, service procedures, load calculating and testing, and a Quinmester posttest. A prerequisite to this course is "Domestic Refrigeration." Included in the document are the course goals, an outline of the specific block objectives and course content, and a list of audiovisual materials. Appended to the document are sample Quinmester posttests. (Author/BP)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

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Course Outline

APPLIANCE REPAIR - ADVANCED - 9027
(Room Air Conditioners)
Department 48 - Quin 9027.04

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DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1973

ED 097522

DADE COUNTY PUBLIC SCHOOLS
1450 NORTHEAST SECOND AVENUE
MIAMI, FLORIDA 33132

Course Outline

APPLIANCE REPAIR - ADVANCED - 9027
(Room Air Conditioners)

Department 48 - Quin 9027.04

county office of
VOCATIONAL AND ADULT EDUCATION

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Dade County Public Schools
Miami, Florida 33132

January, 1973

Published by the School Board of Dade County

Course Description

9027	48	9027.04	Room Air Conditioners
State Category Number	County Dept. Number	County Course Number	Course Title

This quinmester course includes installations, electrical and mechanical servicing, reverse cycle air conditioning, malfunctions, troubleshooting and repair, discharge, pump down and recharging the system. Shop related jobs will also be included. Senior students will be eligible for the cooperative program. They will be placed in industry on a cooperative basis to receive on the job training. This is a two or three quinmester credit course.

Indicators of Success: Prior to entry into this course, the vocational student will display mastery of the skills indicated in Domestic Refrigerators, 9027.03.

Clock Hours: 90, 135

PREFACE

The following quinmester course outline is presented to provide the Major Appliance Service student with a fundamental knowledge of the procedures necessary to apply his understanding of the techniques necessary to install and service the room air conditioner. The student will be able to pump down a unit and recharge with the correct amount and type of refrigerant. The student will also be able to correct any malfunctions in the system.

This quinmester course may be taught in a double quinmester session (2 hour block) for 90 clock hours, or a (3 hour block) for 135 clock hours.

In each instance the course consists of six instructional blocks; however, the double session permits the student to cover each block in more detail and also provides added opportunity to practice and increase his skills.

Manipulative instructional methods include demonstration and shop use of actual appliances, tools and equipment, as well as mock-ups. Related instruction is taught through lecture, books, service manuals, instructional sheets and chalk-board presentations.

An adjunct to the listed instructional methods is provided through the instructors utilization of audiovisual equipment and materials.

This outline was developed through the cooperative efforts of the instructional and supervisory personnel, the Quinmester Advisory Committee, and the Vocational Curriculum Materials Service, and has been approved by the Dade County Vocational Curriculum Committee.

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with Suggested Hourly Breakdown

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GOALS

The student must be able to:

1. Display and practice the job skills he will be expected to perform as a technician.

2. Practice daily all shop safety methods and practices.

3. Explain the cycles of an air conditioning unit using the proper trade terminology.

4. Identify the different components used in a room air conditioning unit.

5. Diagnose and repair a malfunctioning air conditioning unit.

6. Properly conduct a performance check on an air conditioning unit.

7. Satisfactorily complete the quinmester post-test.

SPECIFIC BLOCK OBJECTIVES

BLOCK I - ORIENTATION

The student must be able to:

1. Describe some of the different types of air conditioners used and be able to discuss the methods of installing and maintaining the unit.
2. Identify and list the different applications of air conditioning equipment he will use in the trade.
3. List and explain the primary duties of the air conditioning technician and the career opportunities open to him.
4. Work in a safe and responsible manner by himself and around others, thereby demonstrating his knowledge and understanding of all school and shop regulations.

BLOCK II - ROOM AIR CONDITIONER CYCLES

The student must be able to:

1. Define the operation in detail of the air conditioning cycle using the necessary diagrams and technical trade terminology.
2. Discuss in detail the basic principles of air conditioning.
3. Discuss the relationship of heat and humidity in regard to air conditioning.

BLOCK III - ROOM AIR CONDITIONER COMPONENTS

The student must be able to:

1. Name and describe the function of all the cabinet and chassis components.
2. Discuss the function of each electrical component as used in the room air conditioner.
3. Replace and test a unit component in a room air conditioner.
4. Describe and explain evaporator and condenser construction and describe the types and functions of each as used in the room air conditioner.

BLOCK IV - SERVICE PROCEDURES

The student must be able to:

1. Install an air conditioner in a block wall.

2. Select the proper electrical equipment to control a specific air conditioning unit.

3. Name, describe, and explain the mechanical components involved in the operation of an air conditioning unit.
4. Describe the function of a reversing valve as used in an air conditioning system.
5. Diagnose and repair a malfunctioning air conditioning unit.

BLOCK V - LOAD CALCULATING AND TESTING

The student must be able to:

1. Describe and explain the methods and procedures involved in selecting an air conditioning unit to properly function in a specific area.
2. Correctly follow the procedures of performance checking an air conditioning unit being operated in a specific area.

BLOCK VI - QUINMESTER POST-TEST

The student must be able to:

1. Satisfactorily complete the quinmester post-test.

Course Outline

APPLIANCE REPAIR - ADVANCED - 9027
(Room Air Conditioners)

Department 48 - Quin 9027.04

I. ORIENTATION

A. Introduction
   1. History of air conditioning
   2. Types of air conditioners
      a. Window units
      b. Wall units
      c. Self contained units
   3. Reasons for air conditioning
      a. Comport cooling uses
      b. Industrial uses

B. Student Responsibilities
   1. Lifting techniques
      a. Methods of lifting
      b. Lifting equipment
   2. Installation procedures
      a. Installing in wall
      b. Installing in window
      c. Free-standing unit
   3. Servicing procedures
      a. Servicing in home
      b. Servicing in shop
   4. Tool and equipment maintenance
      a. Identification of tools and equipment
      b. Care of tools and equipment
   5. Shop safety rules
      a. Shop rules
      b. Safety rules

C. Course Benefits
   1. Career opportunities
      a. Field technician
      b. Shop technician
      c. Supervisor, manager, business owner
   2. Learning new and improving basic techniques and skills
      a. Diagnosing malfunctions
      b. Servicing units
      c. Checking and testing

II. ROOM AIR CONDITIONER CYCLES

A. Fundamentals
   1. Types of air conditioners
   2. Cycles of operation
   3. Customer education

B. Air and Humidity
   1. Factors required for air conditioning
      a. Temperature control
      b. Humidity control
      c. Air movement and circulation
      d. Air filtering, cleaning and purification
   2. Properties of air
      a. Layers around earth
      b. Mixtures of gases
   3. Temperature
      a. Temperature measurement
      b. Heat transfer
   4. Humidity
      a. Absolute humidity
      b. Relative humidity
      c. Dew point
      d. Humidity measurement
      e. Psychrometric properties of air
      f. Psychrometric chart

C. Air Cleaning
   1. Classes of impurities
   2. Air cleaning devices
      a. Types of filters
      b. Functions of filters

III. ROOM AIR CONDITIONER COMPONENTS

A. Construction
   1. Cabinet
      a. Wall sleeve
      b. Blower assembly
      c. Filters
      d. Grille
   2. Electrical controls
      a. Outside unit
      b. Selector switch
      c. Thermostat
      d. Relay
      e. Overload switch
      f. Capacitor
      g. Fan motor

B. Refrigeration Unit Components
   1. Motor-compressor
      a. Types of motors
      b. Principle of operation
      c. Procedures to replace unit
      d. Procedures to test unit
      e. Methods of checking external motor terminals
   2. Evaporators
      a. Construction of evaporators
      b. Types of evaporators
      c. Functions of evaporators
   3. Condenser
      a. Construction of condensers
      b. Types of condensers
      c. Functions of condenser
   4. Metering devices
      a. Types of metering devices
      b. Functions of metering device
      c. Methods of testing and replacing cap tube

IV. SERVICE PROCEDURES

A. Installation Procedures
   1. Techniques of uncrating
   2. Handtruck operation
   3. Techniques of installing
   4. Tools required for installation
   5. Operational check
   6. Clean-up procedures
   7. Customer instruction

B. Electrical Service Operations
   1. Switches
   2. Relays
   3. Capacitors
   4. Thermostats
   5. Motors
   6. Wiring

C. Mechanical Service Operations
   1. Cabinet components
   2. Chassis components
   3. Unit replacement
      a. Compressor
      b. Evaporator
      c. Metering device
      d. Condenser

D. Reverse Cycle Controls
   1. Advantages of heating
   2. Operation of valve
   3. Testing a reverse cycle system

E. Air Conditioner Malfunctions
   1. Will not run
   2. Will not cool
   3. Too cold
   4. Unit cycles on and off
   5. Sweating
   6. Noisy

F. Trouble-Shooting and Repair
   1. Check electrical connections and voltage
   2. Clean condenser
   3. Testing fan motors
   4. Removing and replacing fan motors
   5. Testing motor-compressor unit
   6. Replacing motor-compressor unit
   7. Checking and cleaning capillary tube
   8. Replacing capillary tube
   9. Test and adjust thermostat
   10. Replace thermostat
   11. Testing relays
   12. Replacing relays
   13. Testing capacitors
   14. Replacing capacitors
   15. Discharging and recharging a unit
   16. Installing a window unit

V. LOAD CALCULATING AND TESTING

A. Calculating Load
   1. Reasons for calculating load
   2. Calculation factors
      a. Heat load
      b. Types of heat
   3. Estimating load
      a. Mathematics required
      b. Forms

B. Installation
   1. Location of air conditioner
   2. Methods of installing conditioner
   3. Checking completed installation

C. Electrical Requirements
   1. Residential wiring
      a. Voltage
      b. Amperage
      c. Wattage
   2. Wall receptacles
      a. Voltage
      b. Amperage

D. Performance Checking Procedures - Room Air Conditioner Check
   1. Charts
   2. Temperature measuring instruments
   3. Electrical testing instruments

VI. QUINMESTER POST-TEST

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(Room Air Conditioners)

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2. Anderson, Edwin P. Home Appliance Servicing. New York: Howard W. Sams and Company, Inc., 1967. Pp. 600.

3. Marsh, Warren R., and Olivio, C. Thomas. Principles of Refrigeration. Albany, New York: Delmar, 1966. Pp. 374.

4. Tricomi, Ernest. How to Repair Major Appliances. New York: Howard W. Sams and Company, Inc., 1964. Pp. 224.

Supplementary References:

5. Domestic Refrigeration. Los Angeles: Master Publications, Inc. Pp. 80.

Manufacturers' Manuals:

6. Basic Electrical Refrigeration Controls. Booklet R-10, #821230, La Porte, Indiana: Whirlpool Corporation.

7. Brazing-How and Why. Booklet G-9, #829003, La Porte, Indiana: Whirlpool Corporation.

8. Room Air Conditioner Load Calculation and Testing. Booklet R-12, #821296, La Porte, Indiana: Whirlpool Corporation.

9. Use and Care of Test Instruments. Booklet G-5, #828439, La Porte, Indiana: Whirlpool Corporation.

Audio Visual Aids:

Slides and Records:

1. Definitions. #GTR-1. 34 slides. Color. 1970. Carrier Air Conditioner Company.

2. Refrigeration Cycle. #GTR-2. 30 slides. Color. 1970. Carrier Air Conditioner Company.

Audio Visual Aids:

Filmstrips and Cassette Tapes:

3. Basic Electrical Refrigeration Controls. Filmstrip R-10, Whirlpool Corporation. #821229

4. Basic Electrical Refrigeration Controls. Cassette Tape R-10. Whirlpool Corporation. #821228

5. Brazing-How and Why. Filmstrip G-9. Whirlpool Corporation. #829229

6. Brazing-How and Why. Cassette Tape G-9. Whirlpool Corporation. #829005

7. Room Air Conditioner Load Calculation and Testing. Filmstrip R-12. Whirlpool Corporation. #821297

8. Air Conditioner Load Calculation and Testing. Cassette Tape R-12. Whirlpool Corporation. #821298

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10. Use and Care of Test Instruments. Cassette Tape G-5, Whirlpool Corporation. #828459

A P P E N O I X

Quinmaster Post-Test Samples

QUINMESTER POST-TEST

Name_____Date_____Score_____

I. TRUE-FALSE

_____ 1. Comfort cooling is important in today's modern living.

_____ 2. The evaporator of an air conditioning unit releases heat.

_____ 3. The fahrenheit scale is the temperature scale used in industry.

_____ 4. There are three basic methods of heat transfer.

_____ 5. Heat flows from a low temperature object to a high temperature object.

_____ 6. Heat flows through the metal walls of tubing by radiation.

_____ 7. Air filters on air conditioners should be cleaned regularly.

_____ 8. The condensing unit absorbs heat.

_____ 9. The compound gauge is installed on the low side of the system.

_____ 10. The squirrel cage fan decreases the noise of the fan.

QUINMESTER POST-TEST

Name_____Date_____Score_____

II. COMPLETION

1. The function of the compressor is to receive refrigerant vapor at a _____ temperature and pressure and change it to a _____ temperature and pressure.

2. A hermetic unit may be either a reciprocating or _____ type of compressor.

3. The refrigerating unit that has the motor and compressor both enclosed in the same housing is the _____ type.

4. The compressor which has pistons and connecting rods is of the _____ type.

5. The largest single source of power for the compressor is the _____.

6. The relative humidity _____ when the air is heated.

7. The sling psychrometer is used to measure _____ in the air.

8. Fog is condensed _____ in the air.

9. Water exists in the air in invisible _____ form.

10. A complete air conditioning system must control the temperature, the _____, cleanliness and the air movement.

ANSWER KEY TO QUINMESTER POST-TEST

I. TRUE-FALSE

1. True
2. False
3. True
4. True
5. False
6. False
7. True
8. False
9. True
10. True

II. COMPLETION

1. low
   high
2. rotary
3. hermetic
4. reciprocating
5. electric motor
6. decreases
7. humidity
8. water vapor
9. vapor
10. humidity